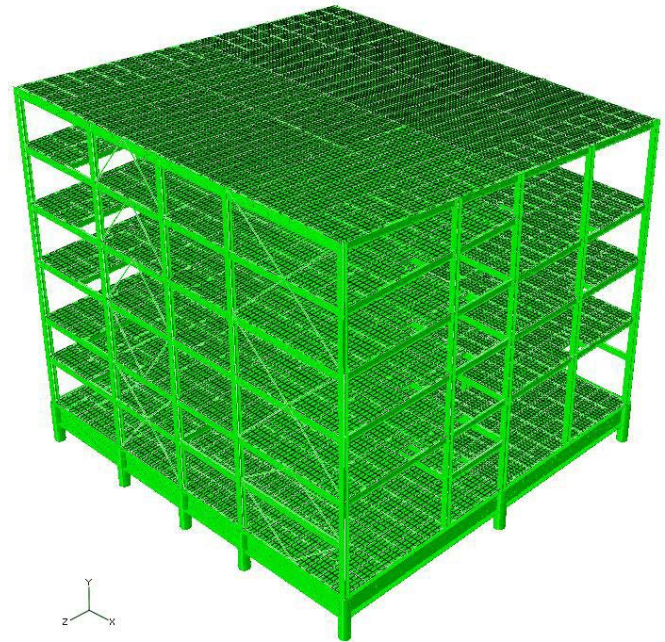


The Problem

Our client required a blast-resistant and fire-resistant design for a multiple story building to be located in Northstar Island, offshore, Alaska. MMI has designed over 150 blast-resistant control rooms/operator shelters/multi-story living quarters and their supporting foundations in petrochemical facilities throughout the world, both onshore and offshore. Therefore, we were the chosen consultancy to oversee this project.

The building in question comprised of a six-story steel frame structure with concrete floors and a footprint of approximately 90' by 92', with 15 steel foundation driven piles (approximately 30-inch in diameter and up to 150-feet long). The construction included living quarters, offices, mechanical and electrical shops, and housing for two ARKTOS vehicles. Weighing approximately 7,000,000 pounds, the building was to be fabricated off-site and delivered via barge due to its size and weight.



FE Model of the building
(walls are not shown for clarity)

Our Approach

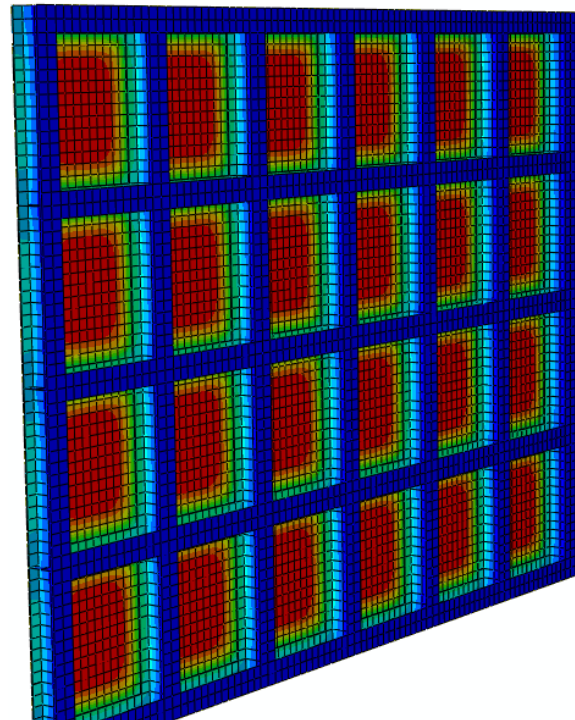
We developed the entire finite element model for the building using ABAQUS/Standard and performed nonlinear finite element dynamic analysis of the structure under blast loads.

The lateral and vertical force resisting systems were evaluated for combined lateral and vertical blast loading using finite element analysis, and the structural components were evaluated using either Single Degree of Freedom (SDOF) methodology, or finite element analysis according to procedures recommended in ASCE Guidelines: "Design of Blast Resistant Buildings in Petrochemical Facilities".

The window and door framing members were designed and evaluated using SDOF analysis.

Outcome

After reviewing the building's seismic design and wind design, our team assisted in the selection of lateral and vertical force resisting systems. When designing the wall structures, MMI evaluated the thermal response of the wall system and recommended appropriate PFP (Passive Fire Protection) to resist the specified fire loading, meeting the required H60 fire rating.



Thermal analysis for the wall